

other. When $p=q$, the corresponding pair will sometimes be identical figures, as to the number, rank, and arrangement of faces and summits; and at other times, as is always the case if p be not equal to q , the two figures will differ. When they differ they may be called a *sympolar* pair, both being *heteropolar*; when they form one and the same figure it may be styled an *autopolar* polyhedron. An elegant way of representing a sympolar pair is deduced from the two following theorems :—

A. The q summits of a q -acron are the angles of a closed polygon of q sides, all edges of the q -acron.

B. A closed polygon of p sides can be traced on the p faces of every p -edron, having a side in every face, and passing through no summit.

December 13, 1855.

Col. SABINE, R.A., Treas. and V.P., in the Chair.

It was announced that Mrs. Young, widow of Thomas Young, M.D., For. Sec. R.S., had presented to the Society a volume of MS. letters addressed to her husband by MM. Arago, Fresnel, Poisson, La Place, A. Humboldt, Berzelius, Biot, Bessel, and Dr. Wollaston.

The following communications were read :—

- I. "On the Action of Sulphuric Acid on the Nitriles and on the Amides." By G. B. BUCKTON and A. W. HOFMANN, Ph.D., F.R.S. Communicated by Dr. HOFMANN. Received December 1, 1855.

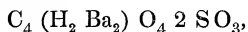
Although the identity of the nitriles with the hydrocyanic ethers has been established by the experiments of M. Dumas, who obtained them by the action of anhydrous phosphoric acid upon certain ammoniacal salts, chemists have hitherto in vain sought for a method by which a passage might be effected from the nitriles to the general alcohol derivatives.

Our attention has been directed likewise to the same subject, but

our exertions, like those of our predecessors, have not yet been crowned with success. The researches on which we have been engaged, have, however, furnished some results which appear to us worthy of the interest of chemists, the reactions being at the same time remarkable for their neatness and susceptibility of general application.

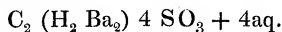
Acetonitrile may be considered as the type of its class, both from the importance of the group to which it belongs, and the facility of its preparation. It is, in fact, the nitrile with which we have been specially engaged. This body when mixed with its own volume of fuming sulphuric acid, evolves a considerable amount of heat, accompanied by a very energetic reaction.

If care be taken to add the acid in small quantities, and to cool the mixture after each addition, scarcely any change of colour is to be observed. By the addition of water, and subsequent saturation with carbonate of barium, a crystalline salt is produced in considerable quantity, which possesses all the characters and composition of the sulphacetate of barium,



discovered some time ago by M. Melsens in the mutual reaction of anhydrous sulphuric acid upon glacial acetic acid.

If, on the contrary, the mixture of acetonitrile and fuming sulphuric acid be made rapidly, and the liquid be rather strongly heated, an abundant evolution of carbonic acid indicates a more profound reaction. The residuary mass, which is tough and of a resinous consistency, when treated with water, and boiled with excess of carbonate of barium, yields a magnificent crystallization of a salt represented by the formula

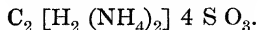


It is a substance of remarkable stability. It does not lose weight at a temperature of $100^\circ \text{C}.$, but four equivalents of water of crystallization are disengaged at $170^\circ \text{C}.$ It is not further affected by a temperature of $220^\circ \text{C}.$ A strong heat resolves it into water, sulphide of barium, sulphurous acid, free sulphur, and carbonic oxide. It may be boiled for hours with fuming nitric acid without the slightest decomposition.

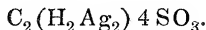
We have also made analyses of the ammonia and silver salts. The former crystallizes with great facility in colourless oblique

prisms, which may be readily obtained upwards of an inch in length. They are anhydrous, and perfectly stable at a temperature of 190° C.

The composition of this salt is represented by the formula



The silver salt is obtained by digesting oxide of silver with an aqueous solution of the new acid. It forms large crystals, which are easily soluble in water, but insoluble in alcohol or ether. They contain

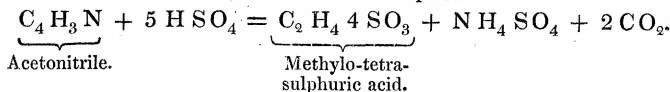
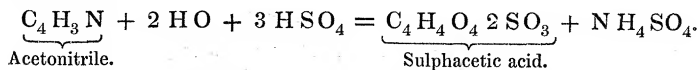


The acid may be obtained by decomposing either the lead or silver salt by hydrosulphuric acid, or perhaps more conveniently, by carefully precipitating a solution of the barium salt with sulphuric acid. It is an exceedingly soluble and deliquescent substance, crystallizing in long needles. It has a sharp acid taste, with somewhat of the flavour of tartaric acid.

For want of a more convenient name, we propose for this acid the appellation of Methylo-tetra-sulphuric acid. Without wishing to decide at present upon its constitution, its composition allows us to consider it as formed by the association of marsh gas with four equivalents of anhydrous sulphuric acid.

In the reaction of sulphuric acid upon acetonitrile, two distinct phases may be traced. In the first, the nascent acetic acid simply combines with two equivalents of sulphuric acid; in the second phase, the acetic molecule undergoes a more thorough transformation; faithful to its tradition it splits into carbonic acid and marsh gas, which remains combined with four equivalents of sulphuric acid. The new substance also may be regarded as sulphacetic acid, which, losing carbonic acid, has assimilated an equal number of equivalents of sulphuric acid.

The two reactions may be represented by the following equations:—



The action, then, of bases and of acids upon acetic acid presents a remarkable analogy.

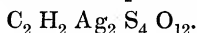
The nature of the change which the acetic molecule suffers, is in fact identical. Under the influence of both agents, it splits into marsh gas and carbonic acid, but in the former case it is the carbonic acid which is fixed, whilst in the latter it is the marsh gas that remains in combination.

The production of methylo-tetra-sulphuric acid calls to mind the interesting substance, sulphate of carbyl, discovered by M. Magnus, by combining olefiant gas with the vapour of anhydrous sulphuric acid. Our new acid is however easily distinguishable from this body, as well by its different composition as by its extreme stability; sulphate of carbyl, as is well known, being decomposed by water into isethionic acid.

As acetamide differs from acetonitrile only in containing two additional equivalents of water, it undergoes with Nordhausen sulphuric acid a strictly analogous transformation.

From the comparative facility of its preparation it offers peculiar advantages for procuring the methylo-tetra-sulphates. The only difference to be noted is, that in this case the ammonia salt is generally eliminated instead of the free acid.

M. Melsens, in his researches upon the sulphacetates, appears in some sort to have anticipated the existence of the methylo-tetra-sulphates. He remarks that he once found in the mother liquor obtained from the preparation of sulphacetate of silver, a crystalline salt, the composition of which he represents by the formula



It is evident that these crystals contain the same elements as methylo-tetra-sulphate of silver, but M. Melsens does not appear to have investigated the subject further than by showing the existence of this silver salt.

A detailed description of the methylo-tetra-sulphates, and the study of the corresponding bodies of other series, will be on our part the subject of a special memoir.